

REMARKS

Claims 26-43 are pending in the subject application. Applicant respectfully requests that the amendment to independent claim 26 to include all of the limitations of dependent claim 43 be entered and that claim 43 be canceled. Applicant respectfully submits that the amendment to claim 26 places the application in condition for allowance, or in better condition for purposes of appeal. Applicant respectfully submits that the amendment does not introduce limitations which require further search by the Examiner since the added limitations to claim 26 are from previously presented claim 43 (now canceled). It is also noted that the limitations of claim 43 were originally in claim 26, as filed, so the Examiner has already searched based on these claim limitations. No new matter has been added to the application by virtue of the present amendment.

Claim Rejections – 35 U.S.C. 112, second paragraph

The Examiner has rejected claims 27-28, 30-31 and 41 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claims 27-28, 30-31 and 41 are dependent upon claim 26, as amended. Applicant's respectfully request that claim 26 be amended to include the limitations of dependent claim 43 which provides the structural relationship between the isolation regions and the diode, as well as antecedent basis for claims 27-28, 30-31 and 41.

Therefore, Applicant believes the rejections to the claims under 35 U.S.C. 112, second paragraph, have been overcome.

Claim Rejections – 35 U.S.C. 102 (b)

The Examiner has rejected claims 26, 29, 35, 37 and 39-40 under 35 U.S.C. 102(b) as being anticipated by Murakami et al. (U.S. Patent No. 5,430,311).

Applicant respectfully requests that independent claim 26 be amended to include all of the limitations of dependent claim 43. Applicant respectfully submits that the Examiner

explicitly stated in the Final Office Action of June 22, 2006, page 4, that Murakami et al. does not teach the “plurality of isolation regions”. Applicant respectfully requests that claim 26 be amended to include the limitations of dependent claim 43 (now canceled) which recites the limitations of: “... forming a **plurality of isolation regions** in said original substrate, said cathode and anode being disposed between adjacent ones of said plurality of isolation regions, said plurality of isolation regions extending deeper into said original substrate than said cathode and said anode.” (emphasis added) Thus, Applicant respectfully submits that Murakami does not anticipate or suggest claim 26, as amended, and claims 29, 35, 37 and 39-40 dependent thereupon.

Regarding claim 39, Applicant respectfully disagrees with the Examiner’s rejection of the claim. In Applicant’s claimed invention (see Fig. 1), anode 20 (p-type) and cathode 12/14 (n-type) are formed on a substrate 10 which is of the same conductivity type as the anode 20 (i.e. p-type) and, as such, a portion of the substrate 10 is not a cathode of the diode. Applicant’s cathode 12/14 (n-type) is a distinct structure formed in a region of the substrate 10 (p-type), and the distinct structure of the n-type cathode 12/14 is in electrical contact with the remaining portion of the p-type substrate 10. FIG’s. 1 and 5 (and related text) of Murakami teach an anode comprising p-type regions 15 and 16, and a cathode comprising n-type regions 13 and 14, wherein anode 15/16 and cathode 13/14 extend through the entire thickness of substrate 1. Murakami’s anode 15/16, cathode 13/14 and substrate 1 are formed entirely as one unitary structure and there is no part of substrate 1 which extends beyond cathode 13/14 to be in electrical contact with cathode 13/14. Thus, Murakami does not anticipate or suggest Applicant’s limitation of “...said cathode is in electrical contact with said original substrate”.

Therefore, Applicant believes the rejections to the claims under 35 U.S.C. 102(b) have been overcome.

Claim Rejections – 35 U.S.C. 103 (a)

The Examiner has rejected claims 28, 31-33, 38 and 41-43 under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. in view of Beasom (U.S. Patent No. 5,841,169); claims 27 and 30 under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. in view of Mack et al.
BUR9-2002-0014-US1

al. (U.S. Patent No. 4,736,271); claim 36 under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. in view of Robinson et al. (U.S. Patent No. 5,268,316); and claim 34 as being unpatentable over Murakami et al. and Beasom, as applied to claim 33 above, and further in view of Robinson et al. (U.S. Patent No. 5,268,316).

Applicant respectfully requests that independent claim 26 be amended to include all of the limitations of dependent claim 43. Applicant respectfully submits that Murakami, individually or in combination with Beasom, Mack et al. or Robinson et al., does not teach or suggest Applicant's claim 26, as amended, or claims dependent thereupon.

As discussed above, the Examiner expressly states in the Final Office Action of June 22, 2006 (page 4) that Murakami does not teach Applicant's claim 26 limitation of the "plurality of isolation regions". The Examiner states that Beasom teaches forming a plurality of isolation regions and that it would have been obvious to form a plurality of isolation regions as taught by Beasom in Murakami's device in order to improve the isolation of the device.

Applicant respectfully disagrees with the Examiner's position that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a plurality of isolation regions as taught by Beasom in Murakami's device in order to improve the isolation of the device. Applicant's claim 26, as amended, recites the limitations of:

"... forming a plurality of isolation regions in said original substrate, said cathode and anode being disposed between adjacent ones of said plurality of isolation regions, said **plurality of isolation regions extending deeper into said original substrate than said cathode and said anode.**" (emphasis added)

Referring to Fig. 1 of the present application, for example, Applicant's claim 26, as amended, is directed to forming an anode 20 of a first conductivity type (e.g. p-type) and a cathode 12/14 of a second conductivity type (e.g. n-type). Note that anode 20 and cathode 12/14 are formed on a substrate 10 which is of the same conductivity type as the anode 20 (i.e. p-type) and as such the substrate 10 is not a cathode of the diode (as is taught by Murakami). Also note that the isolation

BUR9-2002-0014-US1 7

regions 16, 16A of the present invention extend into the p-substrate 10, that is, the isolation regions 16, 16A are formed in the substrate 10 such that their depths terminate within the substrate 10 and do not extend outside of the physical boundaries of the substrate 10. Further, even though the depths of the isolation regions 16, 16A terminate within the substrate 10, the isolation regions 16, 16A still extend deeper than both the cathode 12/14 and the anode 20. Thus, isolation regions 16, 16A are formed within (i.e. “into”) the thickness of substrate 10 **and** deeper than both the anode 20 and cathode 12/14 so that latchup tolerance is improved and lateral injection to adjacent structures is prevented (see paragraph [0039]).

Applicant respectfully submits that it would not have been obvious to a person of ordinary skill in the art at the time the invention was made to form a plurality of isolation regions as taught by Beasom in Murakami’s device in order to improve the isolation of the device. Beasom would not have motivated one of ordinary skill in the art to modify Murakami’s device to provide Applicant’s claimed invention of “... plurality of isolation regions extending deeper into said original substrate than said cathode and said anode.”

Regarding Murakami’s device (see FIG. 1), Murakami teaches an anode comprising p-type regions 15 and 16, and a cathode comprising n-type regions 13 and 14. Adjacent to anode region 16 is anode electrode 3, and adjacent to cathode region 13 is cathode electrode 2. Note that the anode 15/16 and cathode 13/14 of Murakami’s device extend through the entire thickness of substrate 1, that is, the anode 15/16, cathode 13/14 and substrate 1 are formed entirely as one unitary structure and there is no part of substrate 1 which extends beyond cathode 13/14. As such, Murakami’s device does not lend itself to having isolation regions “... extending deeper into said original substrate than said cathode and said anode” since isolation regions would have to extend beyond the anode electrode 3 and cathode electrode 2 in order to provide electrical isolation for the device. Referring to FIG. 5 and column 13, lines 4-8 of Murakami, anode electrode 3/cathode electrode 2 are uniform metallic layers formed over anode region 16 and cathode region 13, respectively, and thus define the “upper” and “lower” physical boundaries of Murakami’s diode (i.e. anode and cathode). In order to isolate Murakami’s diode from adjacent structures would require isolation regions which also isolate metallic electrodes 2/3 of each diode since isolation regions as taught by Beasom formed only in the semiconductor

BUR9-2002-0014-US1

substrate 1 would only physically separate the anode 15/16 and cathode 13/14 regions from adjacent structures but the anode 15/16 and cathode 13/14 would still be electrically coupled to adjacent structures by respective metallic electrodes 3/2 due to the lack of isolation regions formed between metallic electrodes 2/3. Beasom provides no teaching or suggestion for forming isolation regions through or within metallic electrodes.

Thus, the combination of Murakami and Beasom may suggest to one of ordinary skill in the art to form isolation regions to a depth LESS THAN the cathode regions 13, 14 of Murakami's device and not DEEPER as claimed by Applicant since Beasom provides no teaching or suggestion on how to form isolation regions extending beyond the substrate or metallic anode/cathode electrodes formed on surfaces of the substrate. Applicant respectfully submit that modifying Murakami's device with the isolation regions taught by Beasom would not improve the isolation of the device since, as described above, both the anode and cathode of Murakami's device would still be electrically coupled to adjacent structures via the metallic anode and cathode electrodes which would not be isolated by the isolation regions taught by Beasom.

Claims 28, 31-33, 38 and 41-42 are dependent upon claim 26, as amended. For reasons discussed hereinabove, Applicant respectfully submits that Murakami, Beasom, Mack and Robinson, individually or in combination, neither teach nor suggest claims 28, 31-33, 38 and 41-42.

Therefore, Applicant believes the rejections to the claims under 35 U.S.C. 103(a) have been overcome.

CONCLUSION

In light of the foregoing amendments and remarks, all of the claims now presented are believed to be in condition for allowance, and Applicant respectfully requests that the outstanding rejections be withdrawn and this application be passed to issue at an early date.

The Examiner is urged to call the undersigned at the number listed below if, in the Examiner's opinion, such a phone conference would aid in furthering the prosecution of this application. No fee is due by virtue of this amendment. However, if the PTO determines that a fee is required, please charge Applicant's Deposit Account, 09-0456. If any extensions or fees are not accounted for, such extension is requested and the associated fee should be charged to our deposit account.

Respectfully Submitted,

For: Steven H. Voldman

By: /Anthony J. Canale/
Anthony J. Canale
Registration No. 51,526
Agent for Applicant
Phone: (802) 769-8782
Fax: (802) 769-8938
Email: acanale@us.ibm.com

IBM Corporation
Intellectual Property Law - Zip 972E
1000 River Street
Essex Junction, Vermont 05452